



Keeping Air Traffic Services Safe in a COTS Communications Environment

***Diptesh Patel
Communications Networks & Services
National Air Traffic Services Ltd.
United Kingdom***

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The business of air traffic management

*is about enabling
passengers to
depart and arrive*

with safety

on-schedule

economically



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About NATS.....

- ➔ Manages one of the most complex airspace in the world



- ➔ Operates Europe's busiest parallel & single runway airports

- ➔ London Heathrow > 85 Movements/hour
- ➔ London Gatwick > 50 Movements/hour

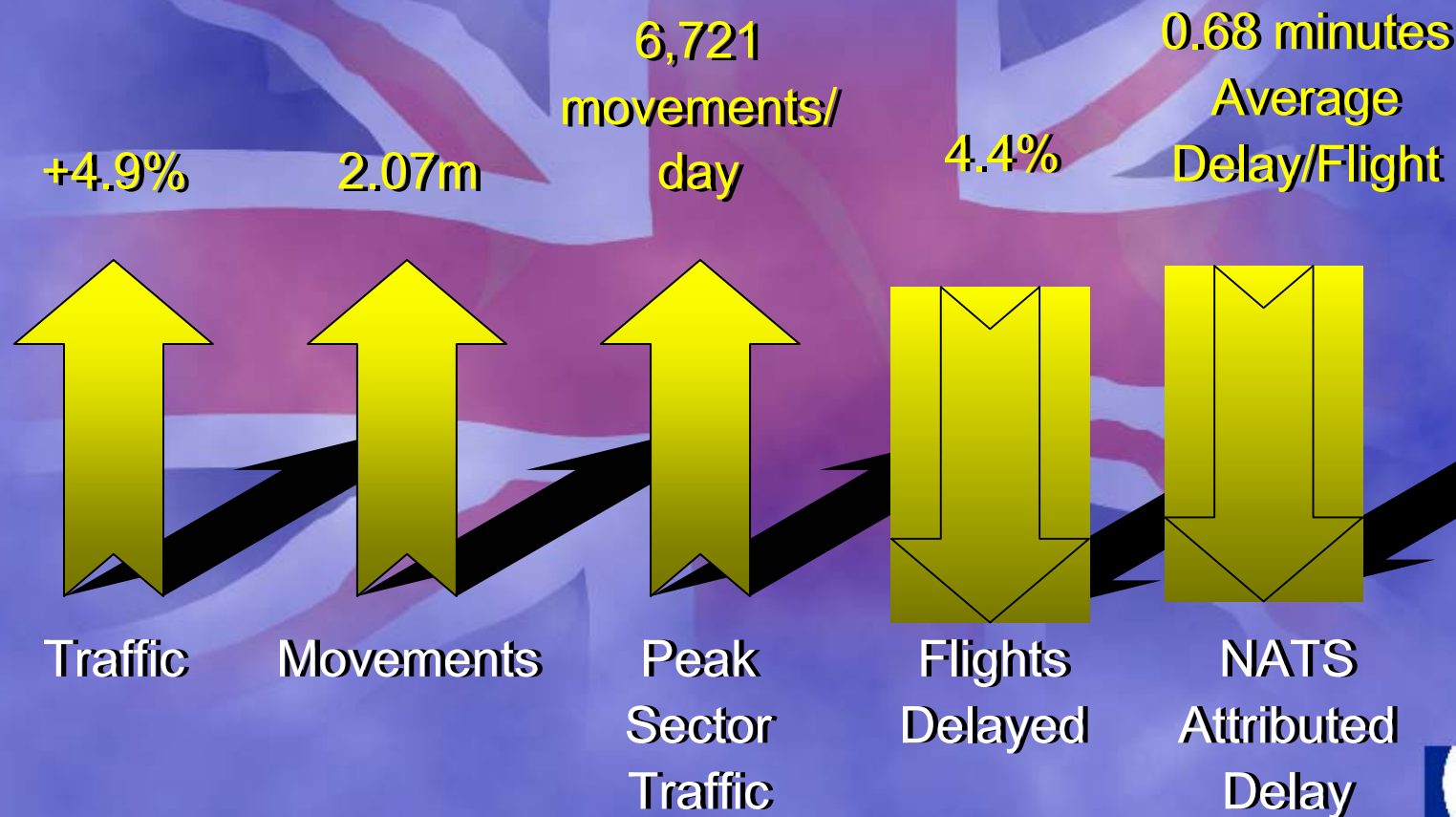
- ➔ Controls and provides U.K. ATM services

- ➔ Over 2 Million Flights / Year (En Route)
- ➔ Over 1 Million Terminal Movements / Year



Strong growth in the UK continues

March 2003/2004

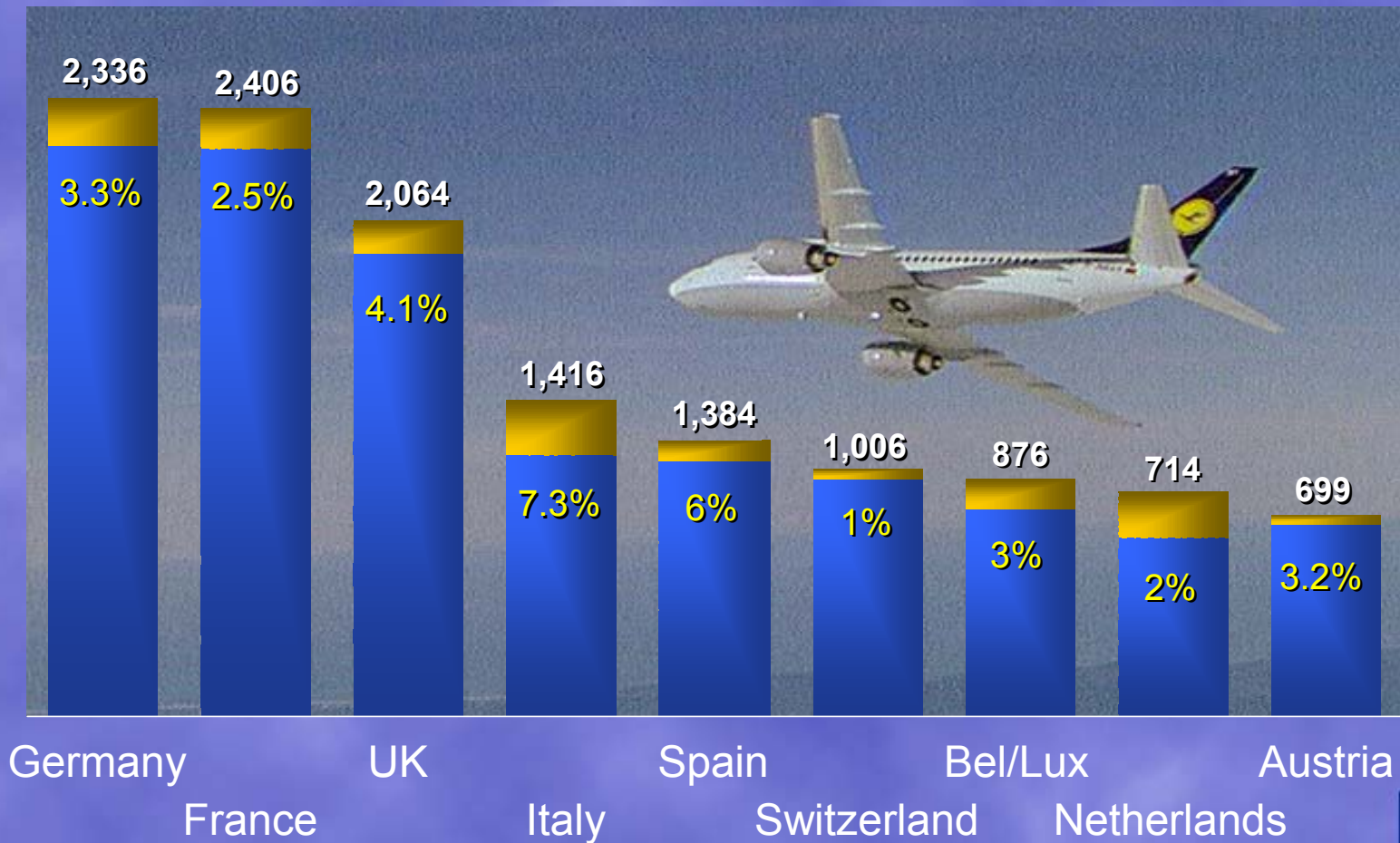


Source: NATS



A similar picture over Europe

European traffic trends, 2003



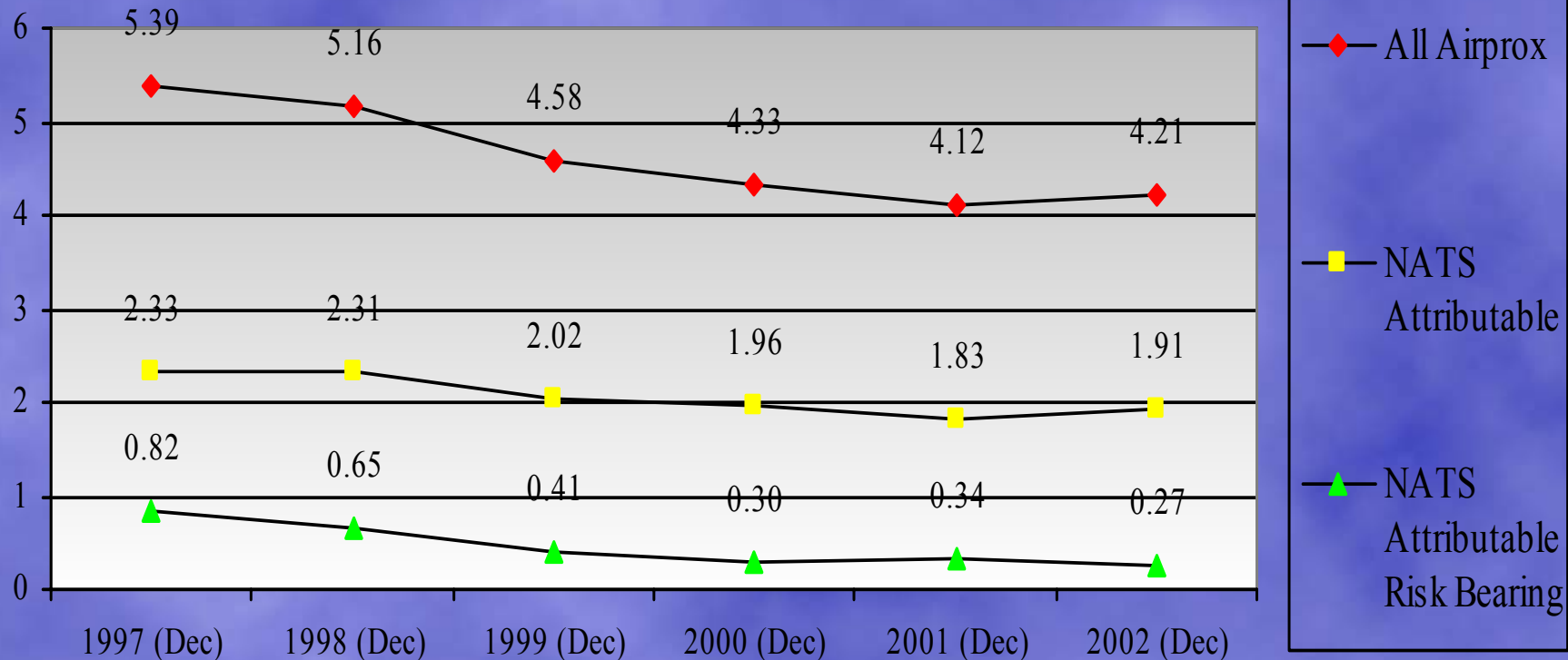
Source: Eurocontrol 2003.



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It's A complicated business

✈️ But NATS does it very safely



Airprox per 100,000 Movements Where NATS Was Providing A Service

Exemplary Safety Record



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The Challenge

Business

Greater capacity requirements

Cost Reduction

Maintaining Safety

Communications

More flexible Comms capabilities

Reduce Bespoke Developments

Robust infrastructure

Safety Must Not Be Compromised

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The Opportunity

✈ Harness the increasing use of COTS communication technologies to

- Benefit from economics of scale
- Provide new communications services
- Reduce development costs

..... While Still Maintaining Safety

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Issues - Safety Assurances

- ✈ Legal obligation to regulatory authorities (CAA-SRG)
- ✈ Difficult to demonstrate safe application of COTS (TCP/IP) technologies
 - Software development
 - De-Facto approaches
 - Un structured protocol development
 - Standards conformance

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Safety is Paramount



Issues- Validation and Verification

- ✈ Protocols standardisation and conformance
- ✈ Convergence need within ATM
- ✈ IP has evolved through De-Facto methods rather through institutional bodies such as ITU, ETSI etc
- ✈ Interoperability of CNS deployments based on TCP/IP needs resolving

Essential to Provide Safety Assurances



Issues- Information Security

- ✈ IP Technologies open the door
 - Widely understood
 - Shared network infrastructures (Ops and non-ops)
- ✈ Risk of compromising safe operation
 - Denial of Service (No air traffic control!)
 - Corrupted or erroneous data
 - Inappropriate use of information
- ✈ Cost impact
 - Additional system level requirements
 - Countermeasures
 - Security v/s performance

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Issues - Performance Management

- ✈️ Adoption of COTS based IP must support QoS
- ✈️ Inconsistencies in development approaches by vendors e.g. TOS field in IP header
- ✈️ Consistent QoS support required throughout the network infrastructure.

**Until a consistent approach is available
NATS is obliged to use Standards based
mechanisms**



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NATS Initiatives- Safety Process

- Based on safety case methodology
 - NATS network safety case is based on static architectures and configurations
- Derivation of reliability figures, topology, routing, resiliency, convergence etc.
- More difficult to derive with adoption of COTS technologies.

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NATS Safety Case Methodology

- ✈ Ensuring that systems, people and processes are Safe
- ✈ Divided in to 4 Sub-Parts
 - Design Phase
 - Installation and Commission
 - Transition to Operational
 - Operational Hand Over
- ✈ Regulated by CAP-670 and SW01
- ✈ Can use applicable safety standards but not mandatory
 - IEC 61508
 - ED 109/DO 278

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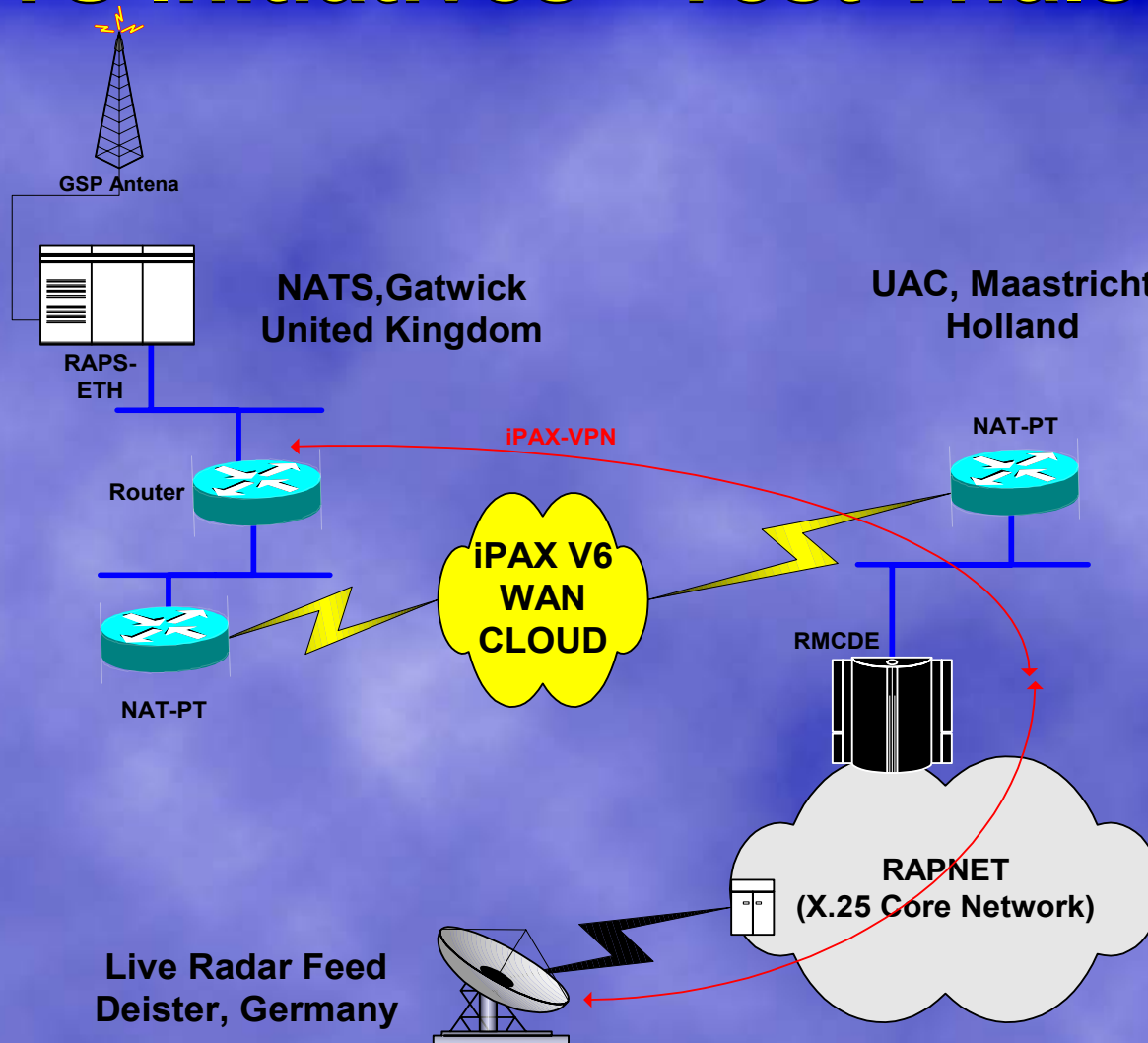
NATS Initiatives - Implementation

- ✈ U.K. Aeronautical Messaging Systems
 - Gateway to Interconnect ATN based AHMS
 - Programme for migration to TCP/IP from X.25
 - Based on COTS (e.g. SMPT, MS Exchange, Apache, etc)
- ✈ U.K. Flight Data Exchange over TCP/IP
 - Indicative Plans for Migration across Europe
 - Based on IPV6 and IPV4
- ✈ Surveillance Data Distribution over IP

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NATS Initiatives - Test Trials

Surveillance
Data
Distribution
over IPV6



Radar Data (Asterix) over UDP/IPV6

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Resolution of Open Issues

- ➔ Reduce risk of non-coherent COTS developments through ICAO or EuroControl
- ➔ Harmonisation of interoperable CNS applications using TCP/IP within the ATM community
- ➔ Mandatory conformance testing
- ➔ Further research, trials and Investigation
- ➔ International co-ordination between industry, safety regulator and ATC service provider

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CONCLUSION

- ✈ Use of COTS is appropriate due to Economic & Technological reasons
- ✈ Critical issues for resolution are
 - Providing safety assurance
 - Information security
 - Validation and verification
 - Performance management
- ✈ Need for widespread International collaboration

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Message.....

Safety is Paramount

- ✈ NATS Is Pro-actively Manage Risks Posed by Technology and Other Threats
- ✈ Being One Step Behind Is Unacceptable
- ✈ NATS Has Responded to Tackle Such Challenges to Ensure That Future Safety of Our Skies Is Maintained

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